

Appl. No 09/874,395

Amendment dated October 17, 2005

Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listings of Claims:

Claim 1 (currently amended): A method of regulating the rate of packet grants ~~[[in]]~~ for an asynchronous cross-point switch, said method comprising:

~~incrementing a counter for every packet grant issued by an arbiter to a traffic source to release a packet having a particular output for a destination;~~

incrementing, in a plurality of output ports of the asynchronous cross-point switch, a corresponding plurality of grant counters, in response to packet grants issued by an arbiter to multiple traffic sources that maintain virtual output queues (VOQs);

wherein the packet grants are to be used for release, by the multiple traffic sources on corresponding multiple buses to the input ports of the asynchronous cross-point switch, of packets having particular output ports of the asynchronous cross-point switch as destinations, for transfer through the asynchronous cross-point switch; and

decrementing the counter each time a packet stored in a buffer is read out from the buffer a grant counter when a packet with a particular output port as destination is read out from a corresponding buffer in the asynchronous cross-point switch; and

instructing the arbiter to cease issuing grants for packets having the an output port as [[a]] destination once the a corresponding grant counter for said output port has exceeded a predetermined threshold;

wherein the arbiter issues packet grants based on VOQ images in the arbiter, and responsive to instructions from the asynchronous cross-point switch.

Claim 2 (currently amended): The method of Claim 1 further comprising:

negating the instruction to the arbiter to cease issuing grants, based at least on a hysteresis setting, thereby to start issuing grants again after said instructing; and
discarding another packet if an input buffer in a traffic source has not been read when a time out occurs.

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Claim 3 (previously presented): The method of Claim 1 wherein:
the predetermined threshold is programmable by writing to a predetermined register.

Claim 4 (currently amended): The method of Claim 1 further comprising:
periodically auditing ~~the counter~~ the grant counters to avoid upward drift due to loss of packets.

Claim 5 (currently amended): The method of Claim 1 further comprising:
~~each time the counter is decremented, decrementing an additional counter;~~
~~incrementing the additional counter for every packet stored into the buffer; and~~
instructing the arbiter to cease issuing grants for packets having ~~the buffer as a~~
destination to be stored in the corresponding buffer once the ~~additional counter~~
corresponding buffer has exceeded an additional predetermined threshold.

Claims 6-11 (canceled).

Claim 12 (new): A method of regulating the rate of packet grants for an asynchronous cross-point switch, said method comprising:
snooping packet grants issued by an arbiter to multiple traffic sources that maintain virtual output queues (VOQs);

wherein the packet grants are issued to be used by the traffic sources to release to input ports of the asynchronous cross-point switch, packets having particular output ports of the asynchronous cross-point switch as destinations;

incrementing in the asynchronous cross-point switch, a plurality of grant counters associated with particular output ports as destinations, in response to said snooping;

decrementing a grant counter when a packet with a particular output port as destination is read out from a corresponding buffer in the asynchronous cross-point switch;

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instructing the arbiter to cease issuing grants for packets having an output port as destination once a corresponding grant counter for said output has exceeded a predetermined threshold;

negating the instruction to the arbiter to cease issuing grants, based at least on a hysteresis setting;

instructing the arbiter to cease issuing grants for packets to be stored in the corresponding buffer once the corresponding buffer has exceeded an additional predetermined threshold; and

auditing the grant counters to avoid upward drift due to loss of packets.

wherein the arbiter issues packet grants based on VOQ images in the arbiter, and responsive to instructions from the asynchronous cross-point switch.

Claim 13 (new): The method of Claim 12 further comprising:

inserting, at the output ports of the asynchronous cross-point switch, the packet grants into packets to be transmitted to the traffic sources.

Claim 14 (new): The method of Claim 12 further comprising:

inserting, at the output ports of the asynchronous cross-point switch, packet grants and back-pressure fields into packets to be transmitted to the traffic sources.

Claim 15 (new): An asynchronous cross-point switch that regulates the rate of packet grants, the asynchronous cross-point switch comprising:

an interface for receiving packet grants issued by an arbiter to traffic sources that maintain virtual output queues (VOQs);

wherein the packet grants are for release by the traffic sources of packets having particular output ports as destinations, to be transferred through the asynchronous cross-point switch;

a plurality of grant counters, for particular output ports as destinations;

means, coupled to the grant counters and to the interface, for incrementing the grant counters in response to receipt of the packet grants issued by the arbiter;

a plurality of buffers, for holding packets with particular output ports as destinations;

Appl. No 09/874,395

Amendment dated October 17, 2005

means, coupled to the grant counters and to the buffers, for decrementing a grant counter when a packet with a particular output port as destination is read out from a corresponding buffer; and

means, coupled to the grant counters, for instructing the arbiter to cease issuing grants for packets having an output port as destination once a corresponding grant counter for said output port has exceeded a predetermined threshold.

Claim 16 (new): The asynchronous cross-point switch of Claim 15 further comprising:

means for negating the instruction to the arbiter to cease issuing grants, based at least on a hysteresis setting.

Claim 17 (new): The asynchronous cross-point switch of Claim 15 further comprising:

means for periodically auditing the grant counters to avoid upward drift due to loss of packets.

Claim 18 (new): The asynchronous cross-point switch of Claim 15 further comprising:

means for instructing the arbiter to cease issuing grants for packets to be stored in a buffer, once the buffer has exceeded an additional predetermined threshold.

Claim 19 (new): The asynchronous cross-point switch of Claim 15 comprising:

means for inserting, at the output ports of the asynchronous cross-point switch, packet grants and back-pressure fields into packets to be transmitted to the traffic sources.

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